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TITLE: METHOD AND SYSTEM FOR VEHICLE PREFERENCE SELECTION MONITORING

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METHOD AND SYSTEM FOR VEHICLE PREFERENCE SELECTION MONITORING

FIELD OF THE INVENTION

In general, the invention relates to data transmission over a wireless communication system. More specifically, the invention relates to a method and system for communicating a mobile vehicle preference selections and associated information.

BACKGROUND OF THE INVENTION

Mobile communication units (MCU's), such as cellular phones, personal data assistants (PDA's), Global Positioning System (GPS) devices, and on-board Vehicle Communication Units (VCU's), used in conjunction with a Wide Area Network (WAN), such as a cellular telephone network or a satellite communication system, have made it possible for a person to send and receive voice communications, data transmissions, and FAX messages from virtually anywhere on earth. Such communication is initiated at the MCU when it is turned on, or by entering a phone number to be called, or in many cases, by pressing a preprogrammed button on the MCU or speaking a voice command causing the MCU to automatically complete the process of dialing the number to be called. A radio communication link is established between the MCU and a Wide Area Network (WAN), using a node of the WAN in the vicinity of the MCU.

In cellular telephone systems, a node is commonly referred to as a "cellular base station." Once the radio communication link between the MCU and the cellular base station has been established, the base station then utilizes a combination of additional cellular stations, conventional telephone wire line networks, and possibly even satellite systems to connect the MCU to the number to be called.

Wireless communication services for MCU users, such as navigation and roadside assistance, have increased rapidly in recent years. Most of the services that have been offered are for a motor vehicle in operation, and include services that may require location and destination information. Such services are provided at a cost to the MCU users, and also at a cost to the MCU service provider. MCU service providers must make available a wireless communication service customer assistance center (or other such manually staffed service center) in order that an operator or customer assistant may complete the MCU requests. It would be beneficial to the MCU user and service provider to offer information and services advantageous to the MCU user, yet profitable to the MCU provider without MCU user subsidies. In addition, limited MCU equipped vehicle information is currently requested or used for the immediate advantage of the MCU user. Also, the current MCU equipped vehicle information is of little use to MCU providers or any other third party concern.

Thus, there is a significant need for a method and system for improving wireless communication services, vehicle information requests, and vehicle information use that overcome the above disadvantages and shortcomings, as well as other disadvantages.

SUMMARY OF THE INVENTION

One aspect of the invention provides a method for vehicle preference selection monitoring by initiating communication between a mobile communication unit and a base station. The base station requests at least one vehicle preference setting from the mobile communication unit. Upon receiving the request for vehicle preference settings, the mobile communication unit determines vehicle preference data. The mobile communication unit transmits the vehicle preference data, to be received at the base station.

Another aspect of the invention presents a system for providing vehicle preference selection monitoring. The system includes a means for initiating communication between a mobile communication unit and a base station. In addition, the system provides the base station and mobile communication unit a means for requesting, receiving, compiling, and transmitting at least one vehicle preference setting.

Another aspect of the invention provides a computer readable medium for storing a computer program. The computer program is comprised of computer readable code capable of initiating communication between a mobile communication unit and a base station. Further, the computer readable code can be used to request at least one vehicle preference setting from the mobile communication unit, and for the mobile communication unit to receive the request. Additionally, the computer readable code is used by the mobile communication unit to determine any vehicle preference data requested. The computer readable code then is used to transmit to the base station the vehicle preference data from the mobile communication unit. Finally, computer readable code is used to receive the vehicle preference data at the base station.

The foregoing and other features and advantages of the invention will become further apparent from the following detailed description of the presently preferred embodiment, read in conjunction with the accompanying drawings. The detailed description and drawings are merely illustrative of the invention rather than limiting, the scope of the invention being defined by the appended claims and equivalents thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram for one embodiment of a system for accessing a mobile vehicle using a wireless communication system, in accordance with the current invention;

FIG. 2 is a schematic diagram for one embodiment of a voice recognition system compatible with the system of **FIG. 1**, in accordance with the present invention;

FIG. 3 is a schematic view of one embodiment of an apparatus capable of utilizing the systems of **FIG. 1** and **FIG. 2**, in accordance with the present invention; and

FIG. 4 is a flow chart representation for one embodiment of a vehicle preference selection monitoring method utilizing the systems of **FIG. 1**,**FIG. 2**, and **FIG. 3**, in accordance with the present invention.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

FIG. 1 shows an illustration of one embodiment of a system for communicating with a mobile vehicle using a wireless communication system in accordance with the present invention, and may be referred to as a mobile vehicle communication system (MVCS) **100**, and in one embodiment may include the OnStar System as is known in the art. The mobile vehicle communication system **100** may contain one or more mobile vehicles (mobile vehicle communication unit) **110**, one or more wireless carrier systems **120**, one or more communication networks **130**, one or more short message service centers **132**, one or more land networks **140**, and one or more call centers **150**. Call center **150** may contain one or more switches **151**, one or more data transmission devices **152**, one or more communication services managers **153**, one or more communication services databases **154**, one or more advisors **155**, one or more bus systems **156**, and one or more automated speech recognition (ASR) units **157**.

Mobile vehicle **110** may contain a wireless vehicle communication device (module, MVCS module) such as an analog or digital phone with suitable hardware and software for transmitting and receiving data communications. Mobile vehicle **110** may contain a wireless modem for transmitting and receiving data. Mobile vehicle **110** may contain a digital signal processor with software and additional hardware to enable communications with the mobile vehicle and to perform other routines and requested services. Mobile vehicle **110** may contain a global positioning system (GPS) unit capable of determining synchronized time and a geophysical location of the mobile vehicle. Mobile vehicle **110** may send to and receive radio transmissions from wireless carrier system **120**. Mobile vehicle **110** may contain a speech recognition system (ASR) capable of communicating with the wireless vehicle communication device. The module may additionally be capable of functioning as any part or all of the above communication devices and, for one embodiment of the invention, may be capable of data storage, and/or data retrieval, and/or receiving, processing, and transmitting data queries.

Wireless carrier system **120** may be a wireless communications carrier or a mobile telephone system. The mobile telephone system may be an analog mobile telephone system operating over a prescribed band nominally at 800 MHz. The mobile telephone system may be a digital mobile telephone system operating over a prescribed band nominally at 800 MHz, 900 MHz, 1900 MHz, or any suitable band capable of carrying mobile communications. Wireless carrier system **120** may transmit to and receive signals from mobile vehicle **110**. Wireless carrier system **120** may transmit to and receive signals from a second mobile vehicle **110**. Wireless carrier system **120** may be connected with communications network **130**.

Communications network **130** may comprise a mobile switching center. Communications network **130** may comprise services from one or more wireless communications companies. Communications network **130** may be any suitable system or collection of systems for connecting wireless carrier system **120** to at least one mobile vehicle **110** or to a call center.

Communications network **130** may include one or more short message service centers **132**. Short message service center **132** may prescribe alphanumeric short messages to and from mobile vehicles **110**. Short message service center **132** may include message entry features, administrative controls, and message transmission capabilities. For one embodiment of the invention, the short message service center **132** may include one or more automated speech recognition (ASR) units. Short message service center **132** may store and buffer the messages. Short message services may include functional services such as paging, text messaging and message waiting notification. Short message services may include other telematic services such as broadcast services, time-driven message delivery, autonomous message delivery, and database-driven information services. The telematic services may further include message management features, such as message priority levels, service categories, expiration dates, cancellations, and status checks.

Land network **140** may be a public-switched telephone network. Land network **140** may be comprised of a wired network, an optical network, a fiber network, another wireless network, or any combination thereof. Land network **140** may comprise an Internet protocol (IP) network. Land network **140** may connect communications network **130** to a call center. In one embodiment of the invention, a communication system may reference all or part of the wireless carrier system **120**, communications network **130**, land network **140**, and short message service center **132**.

Land network **140** may connect a first wireless carrier system **120** with a second wireless carrier system **120**. Communication network **130** and land network **140** may connect wireless carrier system **120** to a communication node or call center **150**.

Call center **150** may be a location where many calls can be received and serviced at the same time, or where many calls may be sent at the same time. The call center may be a telematic call center, prescribing communications to and from mobile vehicles **110**. The call center may be a voice call center, providing verbal communications between an advisor in the call center and a subscriber in a mobile vehicle. The call center may be a voice activated call center, providing verbal communications between an ASR unit and a subscriber in a mobile vehicle. The call center may contain any of the previously described functions.

The call center may contain switch **151**. Switch **151** may be connected to land network **140**, and may receive a modem signal from an analog modem or from a digital modem. Switch **151** may transmit voice or data transmission from the communication node. Switch **151** may also receive voice or data transmissions from mobile vehicle **110** through wireless carrier system **120**, communications network **130**, and land network **140**. Switch **151** may receive from or send data transmissions to data transmission device **152**. Switch **151** may receive from or send voice transmissions to advisor **155** via bus system **156**. Switch **151** may receive from or send voice transmissions to one or more automated speech recognition (ASR) units **157** via bus system **156**.

Data transmission device **152** may send or receive data from switch **151**. Data transmission device **152** may be an IP router or a modem. Data transmission device **152** may transfer data to or from advisor **155**, one or more communication services managers **153**, one or more communication services databases **154**, one or more automated speech recognition (ASR) units **157**, and any other device connected to bus system **156**. Data transmission device **152** may convey information received from short message service center **132** in communication network **130** to communication services manager **153**.

Communication services manager **153** may be connected to switch **151**, data transmission device **152**, and advisor **155** through bus system **156**. The call center may contain any combination of hardware or software facilitating data transmissions between call center **150** and mobile vehicle **110**.

Communication services manager **153** may receive information from mobile vehicle **110** through wireless carrier system **120**, short message service center **132** in communication network **130**, land network **140**, and data transmission device **152**. Communication services manager **153** may send information to mobile vehicle **110** through data transmission device **152**, land network **140**, communication network **130** and wireless carrier system **120**. Communication services manager **153** may send short message service messages via short message service center **132** to the mobile vehicle. Communication services manager **153** may receive short message service replies from mobile vehicle **110** via short message service center **132**. Communication services manager **153** may send a short message service request to mobile vehicle **110**. Communication services manager **153** may receive from or send voice transmissions to one or more automated speech recognition (ASR) units **157**.

In another embodiment of the invention, short message service (SMS) communications may be sent and received according to established protocols such as IS-637 standards for SMS, IS-136 air interface standards for SMS, and GSM 03.40 and 09.02 standards. These protocols allow for example, short messages comprised of up to 160 alpha-numeric characters and may contain no images or graphics. Similar to paging, an SMS communication may be posted along with an intended recipient, such as a communication device in mobile vehicle **110**. The SMS communication may be sent by a communication services manager in a call center, transferred to a short message service center (SMSC), and conveyed to the intended recipient. In one embodiment of the invention, mobile vehicle **110** may receive an SMS message when the ignition is on, or when put into an SMS-ready or service-ready mode while the ignition is off. The mobile vehicle **110** may be placed in a powered down or quiescent mode while the ignition is off. When the mobile vehicle is placed into a service ready mode, the phone in the mobile vehicle may register with a local wireless carrier if needed, or with the subscriber's home system if the mobile vehicle is not roaming. If an SMS message is waiting to be sent, the wireless carrier may deliver the message and the mobile phone may acknowledge receipt of the message by an acknowledgment to the SMSC. Mobile vehicle **110** may perform an operation in response to the SMS message, and may send an SMS reply message back to the call center. Similarly, another embodiment of the mobile vehicle **110** may originate an SMS message to the call center through the SMSC.

In one embodiment of the invention, the communication services manager **153** may determine whether an SMS communication should be sent to mobile vehicle **110**. An SMS message may be initiated in response to a subscriber request, such as a request to unlock the vehicle doors. An SMS message may be sent automatically, for example, when an update or vehicle preset value is desired or when a diagnostic message is needed. In another embodiment of the invention, a SMS message may be sent to periodically check the location and

status of mobile vehicle **110**, and for another embodiment of the invention, to request data collection, data retrieval, and/or data submission from mobile vehicle **110**. Communication services manager **153** may also provide further requests and determinations based on a reply from mobile vehicle **110**. Communication services manager **153** may provide information to mobile vehicle **110** from communication services database **154**.

Communication services database **154** may contain records on one or more mobile vehicles **110**. A portion of communication services database **154** may be dedicated to short message services. Records in communication services database **154** may include vehicle identification, location information, diagnostic information, status information, recent action information, and vehicle passenger (user) and operator (user) defined preset conditions regarding mobile vehicle **110**. Communication services database **154** may provide information and other support to communication services manager **153** and automated speech recognition (ASR) units **157**, and in one embodiment of the invention to external services. External services can be for example, vehicle repair services, rental agencies, marketing firms and manufacturers. Another embodiment of the invention may require external services to be authorized, such as having a multi-use license, or pre-approved such as for a one-time use.

Another embodiment of the invention may provide that communication services database **154** include geographic and/or mapping information that may include geographic features such as lakes, mountains, businesses, cities, malls, and any other feature that may be identifiable with a given location. The communication services database **154** may also include points of interest that can be spatially enabled, such as golf courses, rest areas, and historical markers.

Advisor **155** may be a real advisor or a virtual advisor. A real advisor may be a human being in verbal communication with mobile communication device **110**. A virtual advisor may be a synthesized voice interface responding to requests from mobile communication device **110**. Advisor **155** may provide services to mobile communication device **110**. Advisor **155** may communicate with communication services manager **153**, automated speech recognition (ASR) units **157**, or any other device connected to bus system **156**. Another embodiment of the invention may allow for the advisor **155** and ASR units **157** to be integrated as a single unit capable of any features described for either.

FIG. 2 illustrates one embodiment of an ASR unit **200** for ascertaining the acceptability of a spectral vector V_p. A preprocessor **220** may receive a speech signal $U_3[k]$ **210** and in response, provide a set of pole-zero coefficients a_i **223** and u_i **225**. The preprocessor **220** may use the assumption that the speech signal $U_3[k]$ **210** is a linear combination of L previous samples. In one embodiment of the invention, the a_i **223** coefficients may be the resulting predictor coefficients, which may be chosen to minimize a mean square filter prediction error signal e[k] summed over an analysis window. Another embodiment of the invention may provide the preprocessor **220** to transform the speech signal $U_3[k]$ **210** into a representation of a corresponding spectral signal $U_3(z)$.

A feature extractor **230** may receive pole-zero coefficients a_i **223** and u_i **225**, and in response thereto, provide a set of cepstral coefficients C(n) **233** representative of a spectral parameters corresponding to speech signal $U_3[k]$ **210**.

A vector codebook **240** may receive cepstral coefficients C(n) **233** and conventionally provide spectral vector V_p. **244**. In one embodiment of the invention, vector codebook **240** may conventionally transform the cepstral coefficients C(n) **233** to the spectral vector V_p **244**.

A vector classifier **260** may receive the spectral vector V_p **244** as well as keyword W_p **255** from a keywords module **250**. It may be assumed that the dimension of the spectral vector V_P **244** and keyword W_P **255** is m. Another embodiment of the invention may respond that the vector classifier **260** provide either the data packet DP **265** or the rejection message RM **270**. Additionally, the keywords module **250** can be designed to produce voice recognition topics, which may be a group of words, pronunciations, and corresponding word usage statistics (language modeling), created for a specific subject, such as interstate travel, and vehicle user preferences (presets).

ASR unit **200** may consist of digital and/or analog hardware, software, or a combination of hardware and software. In alternative embodiments, ASR unit **200** may be incorporated within a wireless network, a wireline network, a filtering system, or distributed among a transceiver, a wireless network, a wireline network and/or a filtering system.

One embodiment of the invention is further illustrated in **FIG. 3** as an example mobile vehicle (vehicle) **300**, and may utilize one or more embodiments previously detailed. For one embodiment of the invention, the vehicle **300** may be comprised of a vehicle body **310** supported by four wheels **311** and by four suspension devices including springs (not shown), all of a type known in the art. Each suspension includes a variable-force real time controllable damper **315**connected to exert a vertical force between wheel **311** and body **310** at that suspension point. There are many such suspension arrangements known in the art and all are appropriate to this invention.

Each corner of the vehicle may include a linear position sensor **320** that provides an output signal specifying the relative distance between the vehicle wheel and the suspended vehicle body at that corner of the vehicle. Suitable position sensors **320** can be easily constructed by those skilled in the art and any type of position sensor known in the art may be. Each position sensor **320** may provide a signal to a module **325**.

In one embodiment of the invention, the outputs of the position sensors **320** may be provided to a controller (not shown) in communication with or part of the module **325**, which can process the signals to determine the state of the vehicle body **310** and wheels **311** and generate an output actuator control signal for each variable actuator **315**. The output actuator control signal may be applied from the controller through suitable output apparatus to control actuators **315** in real-time to provide a user defined suspension comfort level. Another embodiment of the invention may include sensors for use with user defined variable settings (presets). For example, at least one sensor may be included for any combination of seat position **330**, vehicle speed **340**, steering wheel angular position **335**, radio settings **345**, climate control (for variable atmospheric conditions) **350**, and accessories such as mirror setting, dash lights, etc **355**. An additional embodiment of the invention may include input signals from various vehicle diagnostic sensors, as are known in the art, as well as diagnostic sensors for systems affected by any user-defined presets, and any additional preset component known in the art and not previously mentioned. Obtaining such signals can be easily achieved using known types of sensors available to those skilled in the art, with the sensors in communication with the controller or the module **325**.

FIG. 4 is a flow chart representation for on embodiment of a vehicle preference selection monitoring method **400**, utilizing one or more of the systems previously described in accordance with the present invention. The method may begin with the call center acting as a base station, periodically requesting vehicles for their user defined preferred (preset) configurations **405** and associated data, using a wireless communication system in accordance with the present invention. In one embodiment of the invention, the request may be solicited from the call center for a third party, for example, for a manufactures of vehicle components, for a department of transportation, or for any third party requiring information in accordance with the invention. In another embodiment of the invention, the request may be initiated by the user of the vehicle, verbally through ASR or through a call center advisor, or manually by a mechanical means such as a button. Another embodiment of the invention may provide the third party to act as the base station and request the preset configuration and associated data using a wireless communication system in accordance with the present invention.

Upon receiving a request from the call center, the communication system may contact vehicles capable of communicating in accordance with the present invention **410**. The vehicles may be contacted as a group for batch processing of information (data), and individually if specific user data is requested. When the intended vehicles receive the call centers request, their module may acquire all or part of the vehicles user preset settings, vehicle settings (default values), custom settings, vehicle diagnostics, preset systems diagnostics, or any other information within the scope of the invention **415**. Another embodiment of the invention may provide a memory within, or in contact with the module. The memory may be of any type known in the art suitable for providing at least one of the functions: storing, appending, manipulating, retrieving, and/or deleting of data. For one embodiment of the invention, appending may include any one or more of a time stamp, system identification, date stamp, and/or other informative

attribute. The appending may be performed to the data as it is received from the sensors, during the course of any data storage, and during the transfer of the data.

When the vehicles requested data is transferred from the module, the communication system may relay the data to the call center **420**. In another embodiment of the invention, the communication system may relay the data to a third party location. Additionally, one embodiment of the invention may provide that the call center relay the data to a third party. When the data is received at the call center, the call center may append additional information to the data, for example, subscriber information previously obtained from the vehicle user **425**. The data may then be stored in a database at the call center and may be used for analysis, queries, or any other suitable purpose **430**.

When the data is used for queries, one embodiment of the invention may provide data for any of the user-preset settings **435**. The data for the settings may include driver identification **440**. For one embodiment of the invention, the driver identification may be used for comport settings of individual drivers in multi-driver vehicles, for example, to reinstate a particular individuals preset settings. In another embodiment of the invention, a query of this data may be sent to a third party such as a car rental agency or new car dealership. Any vehicle capable of communicating in accordance with the invention may receive the data and install the user preset settings prior to their entering the vehicle. The settings may include but are not limited to any of radio stations, steering wheel position, seat position, shock absorption preference (comfort level), climate control, and light settings **445**.

Another embodiment of the invention may provide queries to include attributes of the setting use **450**. The setting attributes may include for example, information on geographic location during a settings use, time and duration of the settings use, and the driver identification **455**. Additionally, setting attributes may include brand names of satellite radio stations, and of interchangeable vehicle equipment manufactured for use within the scope of the invention **460**.

Further, another embodiment of the invention may provide queries to include diagnostic data of one or more individual system **465**. The system may be comprised of any one or more components, and may include subsystems, interconnected systems, and isolated systems within the target vehicle **470**. The diagnostic data may include system performance and expenditure information associated with preset and default settings **475**.

The above-described methods and implementation for vehicle preference selection (presets) monitoring and associated information are example methods and implementations. These methods and implementations illustrate one possible approach for ascertaining a vehicles preset data and associated information. The actual implementation may vary from the method discussed. Moreover, various other improvements and modifications to this invention may occur to those skilled in the art, and those improvements and modifications will fall within the scope of this invention as set forth below.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive.